FIGURE 1A
a) Level 1

FIGURE 1B
b) Level 2
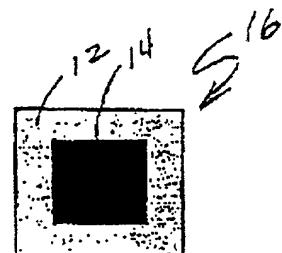
FIGURE 1C
c) Levels 1+2 "aligned"

a) Level 1
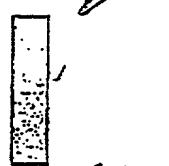
c) Levels 1 + 2 "aligned"

FIGURE 2A

b) Level 2

FIGURE 2

d) Levels 1+2 "misaligned"

FIGURE 2B

Fourier Spectrum of "Aligned" Overlay Target

FFT Magnitude
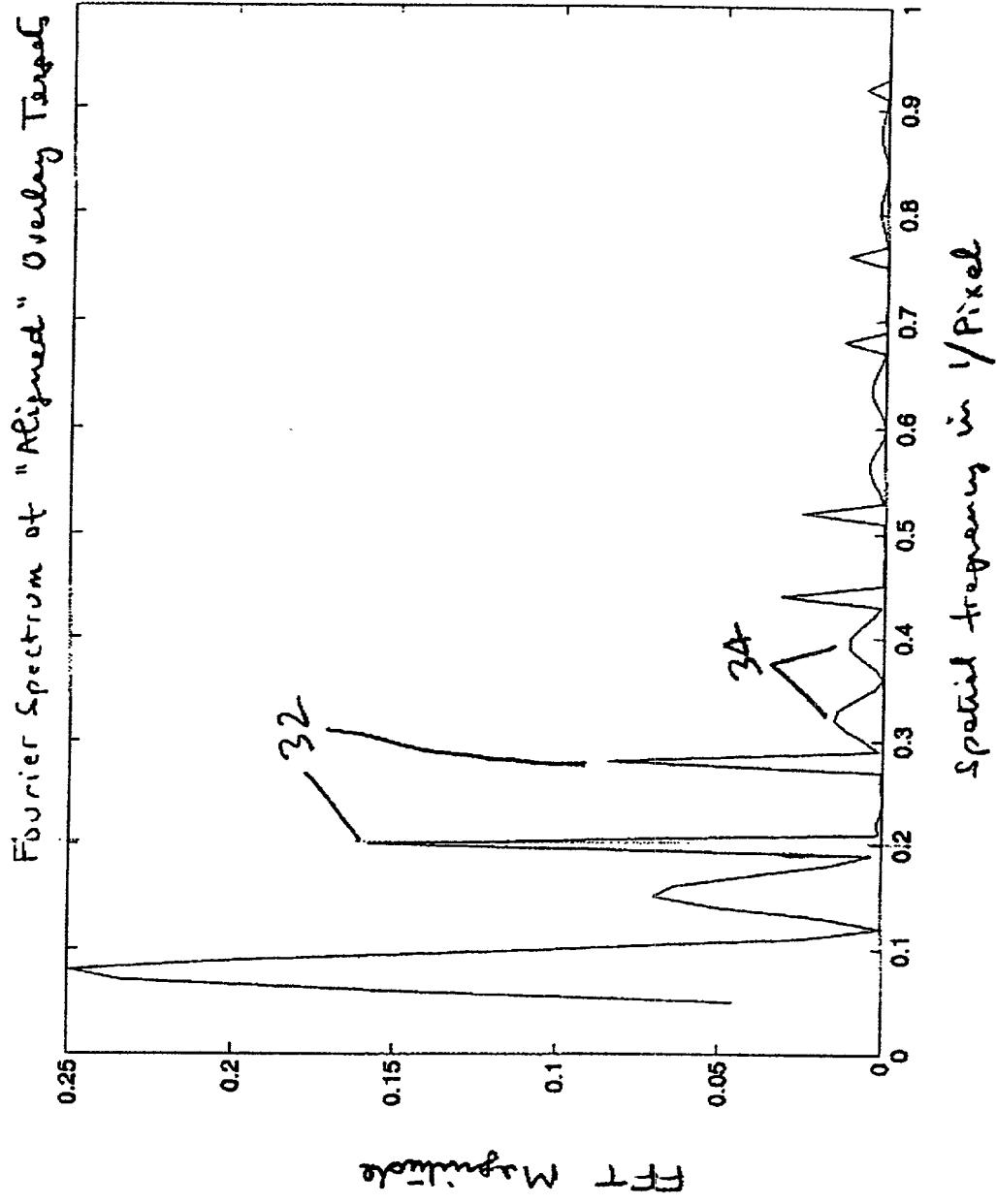
Spatial frequency in 1/Pixel

Fig. 3

Fourier Spectrum of "misaligned" Overlay Targets

44

42

FFT Magnitude
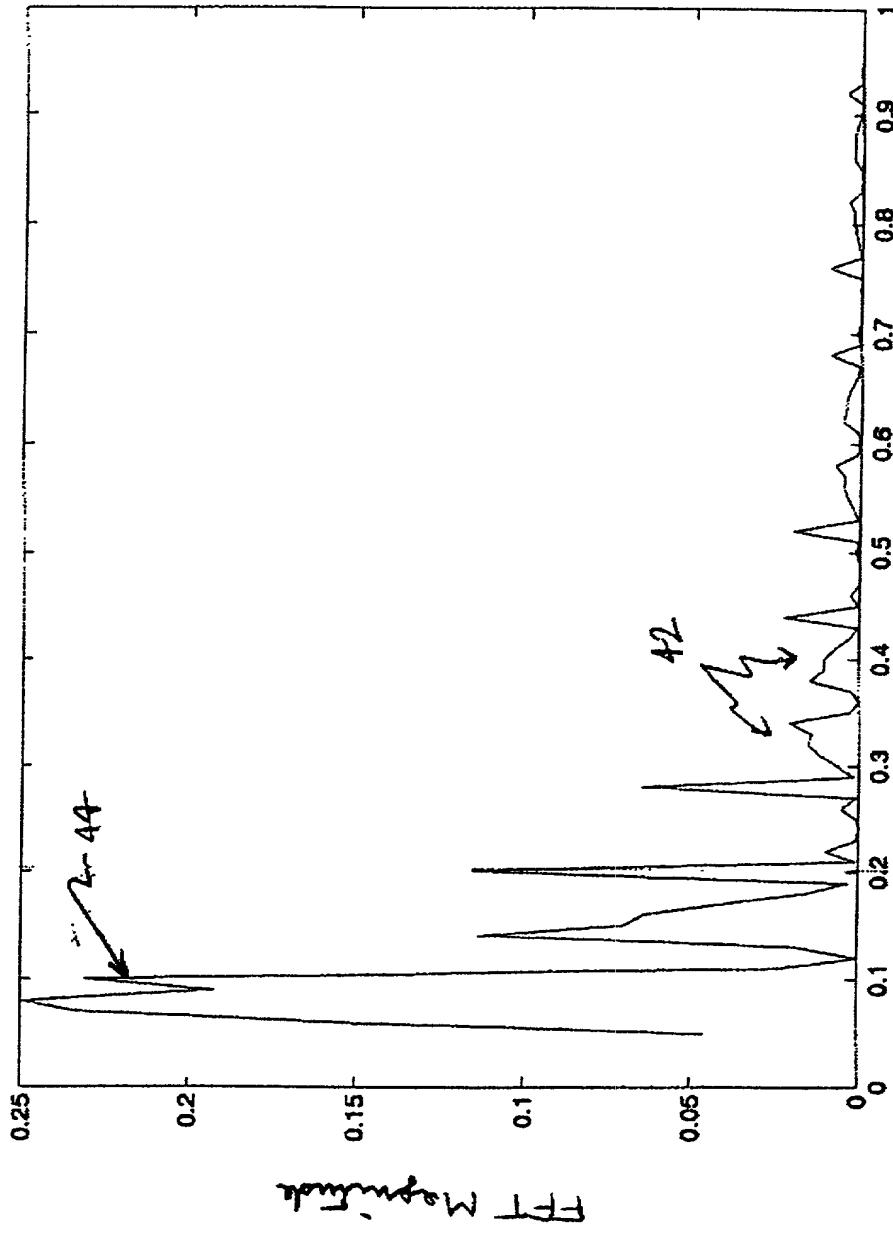
Spatial frequency in 1/Pixel

FIG. 4

Fourier Spectrum of "Aligned" and "Misaligned" Overlay Target

- - - Aligned
—— Misaligned

54
52

FFT Phase
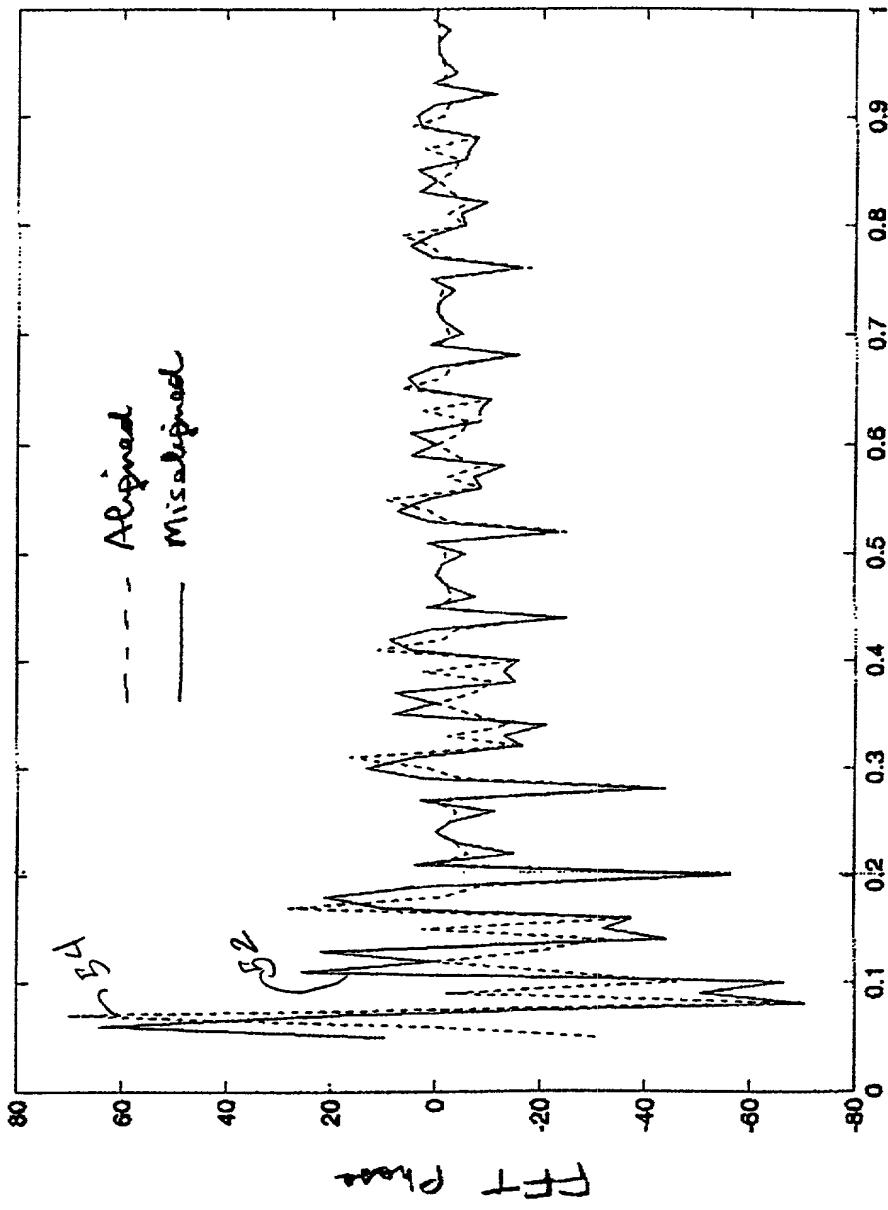
Spatial Frequency in 1/Pixel

FIG. 5

FIG. 6   SCHEMATIC OF MEASUREMENT APPARATUS
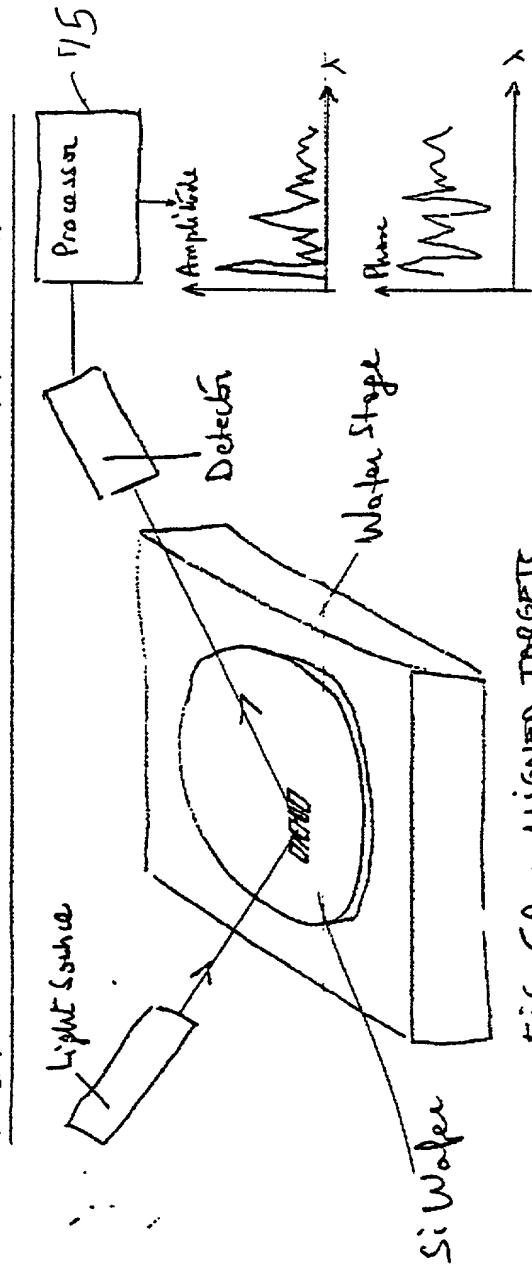

FIG. 6A : ALIGNED TARGET
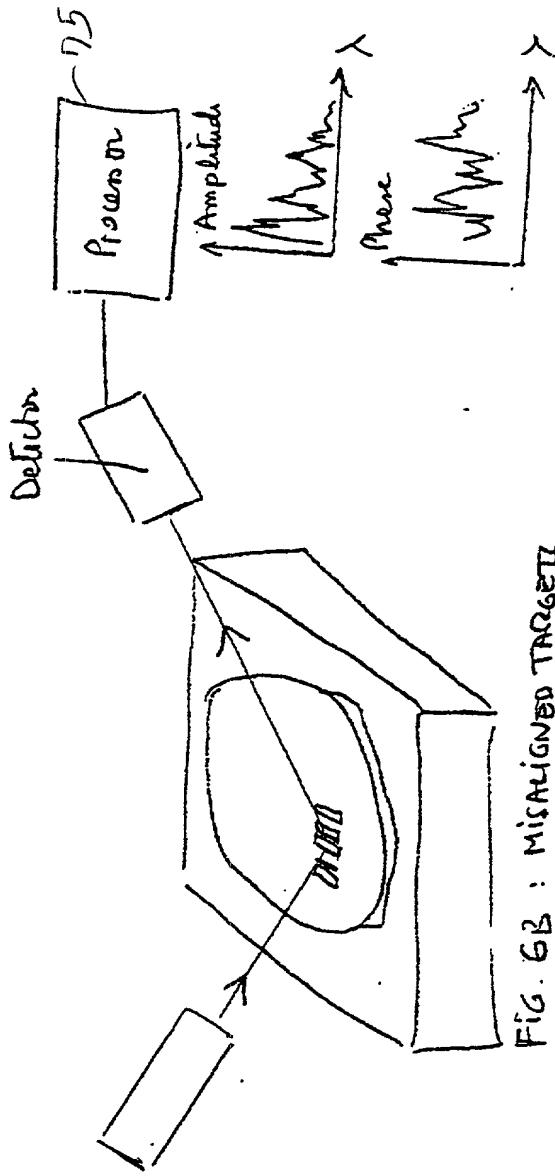

FIG. 6B : MISALIGNED TARGET

FIG. 7   PROCESS FLOW CHART FOR MEASURING OVERLAY ERROR

Broadband Light Source

73

(Wavelength Dispersive) Detector

71

74

72

Composite Overlay target

Si wafer

Generates measured response curve

PC (optimizer)

75

DATA STORAGE
LIBRARY OF RESPONSE CURVES

76

Amplitude

λ

λ

Compare measured curve to stored curves.
- Best fit match

Quantify Misalignment Error
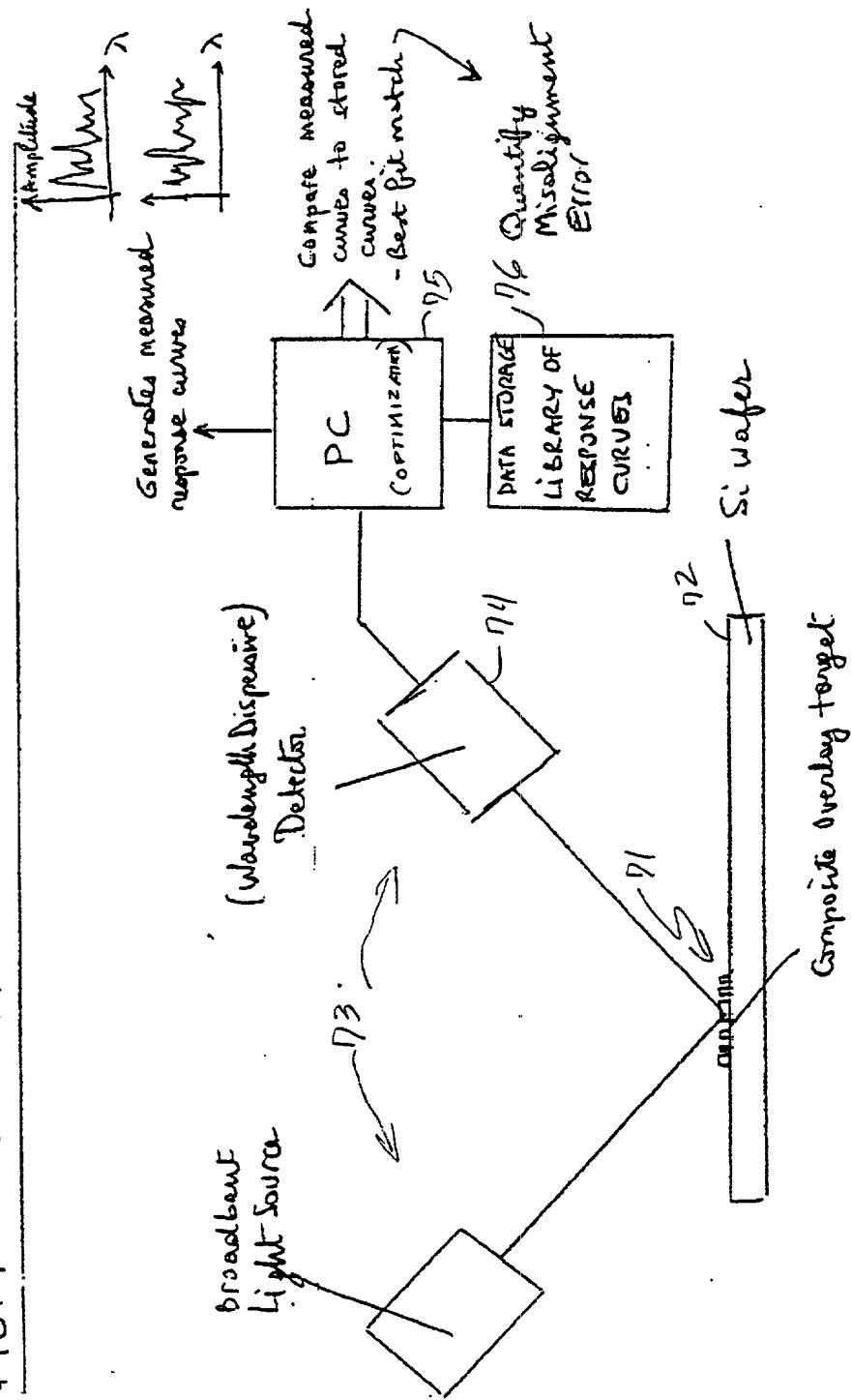
Applicability to Future Technology

	Feature in 1997, 250nm	Feature in 2006, 100nm
CD	250nm	100nm
$CD_{3\sigma}$	230, 250, 270nm	93, 100, 107nm
thickness	800nm	400nm

FIGURE 8